GKN Driveline International GmbH
Hauptstrasse 130
53797 Lohmar

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Process of machining outer joint parts or inner joint parts with pairs of tracks extending parallel relative to one another, wherein said pairs of tracks are machined simultaneously

Claims

1. A process of machining outer joint parts (11) and inner joint parts (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in planes (E_1, E_2,E_3,E4) extending parallel relative to one another,

   characterised in

   that the pairs of ball tracks (12, 22) are machined by rotating disc tools (16, 26) whose axes of rotation (R) perpendicularly intersect the respective longitudinal axis (Aa, Ai) at a distance from one another and are held and guided coaxially relative to one another.

2. A process according to claim 1,

   characterised in

   that, in the course of machining, the outer joint parts (11) and inner joint parts (21) respectively are guided

linearly in the direction of their respective longitudinal axis (Aa, Ai) and that, in the course of machining, the axes of rotation (R) of the disc tools (16, 26) are guided synchronously in a linear or pivoting movement radially relative to the respective longitudinal axis (Aa, Ai).

3. A process according to any one of claims 1 or 2,

characterised in

that at least two pairs of ball tracks (12_1, 12_2, 12_3, 12_4) - more particularly radially opposed pairs of ball tracks - are machined simultaneously.

4. A process according to any one of claims 1 to 3,

characterised in

that the disc tools (16, 26) are driven in pairs at identical speeds.

5. A process of machining outer joint parts (11) and inner joint parts (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in planes (E_1, E_2, E_3, E4) extending parallel relative to one another,

characterised in

that the pairs of ball tracks (12_1, 12_2, 22_1, 22_2) are machined by rotating finger tools (36_1, 36_2) whose axes of rotation (R) intersect the respective longitudinal axis

(Aa, Ai) in pairs symmetrically relative to one another and at a distance from one another and whose axes of rotation (R) are held and guided in pairs and parallel relative to one another.

6. A process of machining outer joint parts (11) and inner joint parts (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in planes (E_1, E_2,E_3,E4) extending parallel relative to one another,

characterised in

that the pairs of ball tracks (12_1, 12_2, 22_1, 22_2) are machined by rotating finger tools (36, 46) whose axes of rotation (R) intersect the respective longitudinal axis (Aa, Ai) in pairs symmetrically relative to one another and at a distance from one another and whose axes of rotation (R) are held and guided in pairs at a constant angle relative to one another.

7. A process according to any one of claims 5 or 6,

characterised in

that, during machining, the outer joint parts (11) and inner joint parts (21) respectively are guided linearly in the direction of their respective longitudinal axis (Aa, Ai) and that, during machining, the axes of rotation (R) of the finger tools (36, 46) are guided in a synchronous movement at a constant angle relative to one another

in such a way that an axis of symmetry (Rs) positioned between the axes of rotation (R) is guided in a linear and/or pivoting movement radially relative to the respective longitudinal axis (Aa, Ai).

8. A process according to any one of claims 5 to 7,

characterised in

that at least two pairs of ball tracks - more particularly radially opposed pairs of ball tracks (12_1, 12_2, 12_3, 12_4) of an inner joint part (21) - are machined simultaneously.

9. A process according to any one of claims 5 to 8,

characterised in

that the rotating finger tools (36, 46) are driven in pairs at identical speeds.

10. A device for machining outer joint parts (11) and inner joint part (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in planes (E_1, E_2,E_3,E4),

characterised in

that it comprises clamping means for an outer joint part (11) or an inner joint part (21) as well as at least two

disc tools (16, 26) whose axes of rotation (R) extend co-axially relative to one another and which perpendicularly intersect the respective longitudinal axis (Aa, Ai) of the outer joint part or inner joint part at a distance from one another.

11. A device according to claim 10,

characterised in

that the clamping means comprise a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis (Aa, Ai) and that the driving device for the disc tools (16, 26) comprises only a feeding device for feeding the disc tools radially relative to the respective longitudinal axis (Aa, Ai).

12. A device according to claim 10,

characterised in

that the clamping means comprise a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis (Aa, Ai) and that the driving device for the disc tools (16, 26) comprises only a pivoting device for pivoting the disc tools (16, 26) around a pivot axis intersecting the respective longitudinal axis (Aa, Ai).

13. A device according to any one of claims 10 to 12,

characterised in

that at least two disc tools (16_1, 16_2, 26_1, 26_2) comprise a common rotary drive.

14. A device according to claim 13,

characterised in

that the at least two disc tools (16_1, 16_2, 26_1, 26_2) are produced so as to form one piece.

15. A device for machining outer joint parts (11) and inner joint part (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in planes (E_1, E_2,E_3,E4) extending parallel relative to one another,

characterised in

that it comprises clamping means for an outer joint part (11) or an inner joint part (21) as well as at least two rotating finger tools (36) whose axes of rotation (R) extend parallel relative to one another and intersect the respective longitudinal axis (Aa, Ai) in pairs symmetrically relative to one another and at a distance from one another.

16. A device for machining outer joint parts (11) and inner joint part (21) of constant velocity universal ball joints, which outer joint parts (11) and inner joint parts (21) each comprise a longitudinal axis (Aa, Ai) and a number of ball tracks (12, 22), wherein the ball tracks are each arranged circumferentially in pairs (12_1, 12_2, 22_1, 22_2) whose central track lines are positioned in

planes (E_1,E_2,E_3,E4) extending parallel relative to one another,

characterised in

that it comprises clamping means for an outer joint part (11) or an inner joint part (21) as well as at least two rotating finger tools (46) whose axes of rotation (R) form a fixed angle relative to one another and intersect the respective longitudinal axis (Aa, Ai) in pairs symmetrically relative to one another and at a distance from one another.

17. A device according to any one of claims 15 or 16,,

characterised in

that the clamping means comprise a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis (Aa, Ai) and that the driving device for the finger tools (36, 46) comprises only a feeding device for feeding the finger tools radially relative to the respective longitudinal axis (Aa, Ai).

18. A device according to any one of claims 15 or 16,

characterised

that the clamping means comprise a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis (Aa, Ai) and that the driving device for the finger tools (36, 46) comprises only a pivoting device for pivoting the finger tools (36, 46) around a pivot axis intersecting the respective longitudinal axis (Aa, Ai).

19. A device according to any one of claims 15 to 18,

characterised in that the at least two finger tools (36_1, 36_2, 46_1, 46_2) comprise a common rotary drive.

20. A device according to any one of claims 15 to 19,

characterised in

that the rotary drive of the finger tools comprises a common spur gear or bevel gear which engages spur gears at the finger tools.